

Name: _____

Date: _____

Math 10F&PC Chapter 2 Trigonometry

2.2 Using the Tangent Ratio to Calculate Lengths

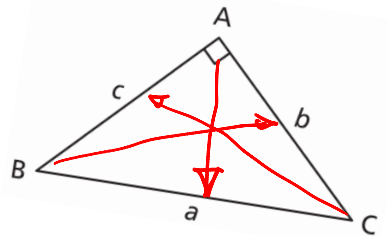
Focus: Apply the tangent ratio to calculate lengths.

- **Direct measurement** use protractor to determine a length or angle in a polygon
- **Indirect measurement** use trigonometry to calculate a length or an angle

The tangent ratio is a powerful tool we can use to calculate the length of a leg of a right triangle. We are then measuring the length of a side of a triangle indirectly. In a right triangle, we can use the tangent ratio, to write an equation. When we know the measure of an acute angle and the length of a leg, we solve the equation to determine the length of the other leg.

It is often convenient to use the lower case letter to name the side opposite a vertex of a triangle

Side BC = a
Side AC = b
Side AB = c



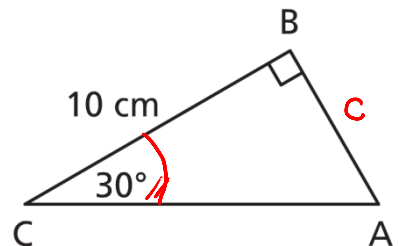
Example 1: Determine the length of AB to the nearest tenth of a centimetre.

$\angle C = 30^\circ$
adj. = a = 10 cm
AB = c = ? = opp.

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan \angle C = \frac{c}{10}$$

$$\tan 30^\circ = \frac{c}{10}$$



$$c = 10 \tan 30^\circ$$

$$c = 10 (0.577) = 5.77 = \boxed{5.8 \text{ cm}}$$

Example 2: Determine the length of EF to the nearest tenth of centimetre.

$$EF = d = \text{Adj.}$$

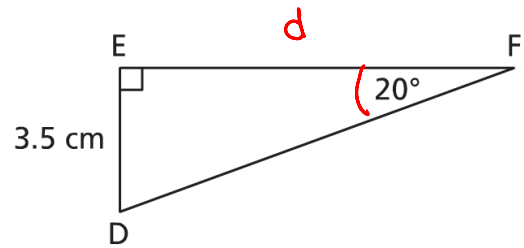
$$\angle F = 20^\circ$$

$$ED = f = \text{opp.}$$

$$\tan 20^\circ = \frac{3.5}{EF}$$

$$EF = \frac{3.5}{\tan 20^\circ}$$

$$EF = \frac{3.5}{(0.3639)} = \boxed{9.6 \text{ cm}}$$



Example 3: A searchlight beam shines vertically on a cloud. At a horizontal distance of 250 m from the searchlight, the angle between the ground and the line of sight to the cloud is 75° . Determine the height of the cloud to the nearest metre.

$$\angle = 75^\circ$$

$$\text{Adj} = 250 \text{ m}$$

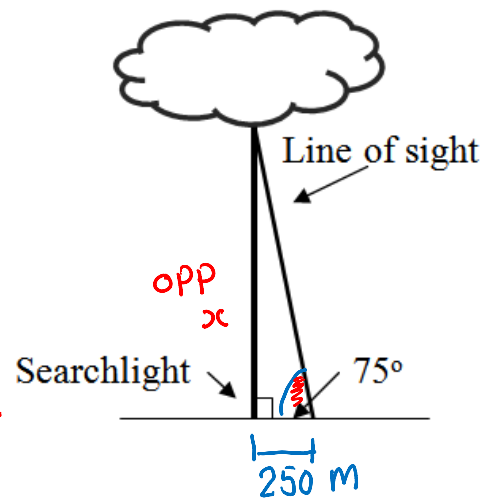
$$\text{opp.} = ?$$

$$\tan 75^\circ = \frac{x}{250}$$

$$x = 250 \tan 75^\circ$$

$$= \boxed{933 \text{ m}}$$

$$\text{height of the cloud} = 933 \text{ m}$$



Example 4: At a horizontal distance of 200 m from the base of an observation tower, the angle between the ground and the line of sight to the top of the tower is 8° . How high is the tower to the nearest metre? The diagram is *not* drawn to scale.

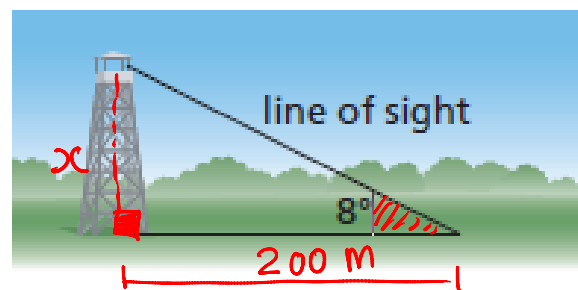
$$x = \text{opp.}$$

$$200 \text{ m} = \text{Adj}$$

$$\tan 8^\circ = \frac{x}{200}$$

$$x = 200 \tan 8^\circ$$

$$x = 28.1 \text{ m} = \boxed{28 \text{ m}}$$



quiz on tuesday

Assignment: p. 82 #3 – 5(a,c), 7 – 9, 11 and 13